1-1954

A Study of the Effect of Avoidance on Stuttering Frequency in an Adaptation Situation

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A STUDY OF THE EFFECT OF AVOIDANCE ON STUTTERING FREQUENCY IN AN ADAPTATION SITUATION

A Thesis

Submitted to the Faculty

of

Western Michigan College of Education

by

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In Partial Fulfillment of the

Requirements for the Degree

of

Master of Arts

January, 1954

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A STUDY OF THE EFFECT OF AVOIDANCE ON STUTTERING FREQUENCY IN AN ADAPTATION SITUATION

I INTRODUCTION

Much of the recent research related to stuttering has been concerned with the adaptation effect. The adaptation effect in stuttering refers to the phenomenon in which the frequency of stuttered words decreases in number when the stutterer continues to read the same passage aloud a number of times. During these readings each successive passage evidences fewer stutterings until a plateau is attained.

Much of the literature has ascribed great importance to avoidance mechanisms as maintaining causal factors. These avoidance mechanisms may be generally classified in two categories which are word avoidance and situation avoidance. In word avoidance the stutterer may avoid feared or difficult words. In situation avoidance the stutterer may avoid speaking situations which place speech pressure or emotional pressure upon him. These two general types of avoidance mechanisms are generally regarded as maintaining causal factors and are often stated as such in the literature. There is no objective study of this relationship on record to the knowledge of this experimenter. This study was designed to answer the question: "Does deliberate avoidance of feared words increase the frequency of stuttering despite the adaptation effect?"

II SURVEY OF THE LITERATURE

Adaptation effect in Stuttering Behavior

An early study by Van Riper and Hull (25) reported the adaptation effect in stuttering. Johnson and Knott (12) noted that the percent of words stuttered declined markedly between the first and tenth reading. Maddox (18) also noted a significant drop in stuttering frequency in multiple readings of the same material. Wischner (27), surveying unpublished studies performed at the University of Iowa, found a tendency for the adaptation curve to reach a plateau at approximately the eighth reading, with relatively small decrease in frequency between the eighth and fifteenth readings. Johnson and Millsapps (13) reported that frequency of stuttering decreased with successive readings of identical material. Yensen (28) also found the maximum decrease to take place in the early readings and a gradual leveling off of the adaptation curve for frequency during the later readings. Johnson and Solomon (15) reported that in four readings of the same material, stuttering frequency was reduced each time, even when a period of from one to seven days elapsed between the second and third readings. Johnson and Inness (10) found a total adaptation of forty-eight per cent, (i.e. 48% fewer stuttered words) on a given passage for five consecutive readings. This indicated that only five readings in succession of the same material were necessary to demonstrate a significant adaptation effect.

Donohue (5) was able to observe the adaptation phenomenon by having subjects read continuously changing material

over a three hour period. The adaptation effect was slowed down markedly in this study by using continuously changing material. This deceleration is particularly evident when compared to the adaptation curves of studies in which the reading material was the same throughout. Bearss (1) observed the adaptation effect occured even under random shock conditions. Harris (6) found that reduction in stuttering frequency with repeated readings tends to be transferred to the reading of similar passages, but that no significant effect on reduction in stuttering frequency occurred in a "conversational" situation. Shulman (22) discovered that adaptation tended to be independent of the length of passage. On passages of 250, 500, and 1,000 words he reported no significant differences in percent of adaptation. He also found that adaptation tends to be retarded in a situation where the reading material was held constant but size of the audience was increased with each consecutive reading. Another result of this study was that adaptation tended to be greater when the intervals between readings were shorter during successive readings of the same passage. Jones (16) investigated adaptation and spontaneous recovery by having stutterers read the same 250-word passage five times daily for five consecutive days, Monday through Friday. A rest interval of approximately twenty-four hours was between each successive adaptation session. Ten days after the fifth adaptation session the subjects were recalled and a sixth

adaptation session of five consecutive readings took place. The results for the first five sessions showed that the frequency of stuttering on the first trial of all sessions was greater than that for the last trial of the previous session. The amount of recovery based on the final adaptation trial for the previous day was approximately 50% of that on sessions two and three. The adaptation decreased progressively for the rest of the sessions.

Certain experiments have touched on the problem obliquely. Johnson and Sinn (14) had their subjects in successive readings of the same material omit all words on which stuttering was anticipated. Despite these instructions a minimal amount of stuttering persisted during these omission readings. Johnson and Millsapps (13) had their subjects successively read a passage in which all words previously stuttered upon were blotted out. They found that some stuttering continued to occur even under these conditions. Milisen (19) had stutterers omit all words on which they expected to stutter on the first reading, but on the second reading "pay no attention to anticipation" but stop and signal when they stuttered. An electric shock was used as punishment for stuttering on a word not anticipated in the first reading. He reported an increase in the number of <u>unanticipated</u> stuttering blocks on the reading following the one in which the subjects were required to avoid feared words.

Avoidance Mechanisms As Causal Factors

Johnson (7) describes the "vicious circle (in which increasing anxiety leads to, and is furthered by, increased expectancy, avoidance motivation, and tension, each reacting cumulatively on the others.") West, Kennedy and Carr (25) declared that substitution of easy for hard words should be discouraged. Kimmell (17) showed that stutterers manifest their avoidance tendencies not only in speech but in social situations. Wischner (27) attributes much of the persistence of stuttering to the anxiety reduction produced by avoidance. Van Riper (24) also feels that stuttering is in part perpetuated by the stutterer's avoidance of feared words and situations.

III STATEMENT OF THE PROBLEM

The adaptation effect in stuttering has become one of the most extensively studied phenomenon in the field of speech correction. Since the superficial gross adaptation effect in stuttering behavior and the extinction of other behavior systems evidence many similarities, a large percentage of the studies in this area have been designed toward the integration of the stuttering adaptation phenomenon within a framework of learning theory. Studies, in this frame of reference, proceed on the assumption that stuttering is learned behavior. For this reason scientific investigation has concerned itself with the possible effects of numerous variables upon this particular behavioral phenomenon. As has been mentioned in the survey of the literature, an enormous fund of knowledge has been acquired concerning the adaptation phenomenon, its characteristics and many of the conditions which affect it. An extensive review of the literature in this area has not indicated any study specifically concerned with the effect of deliberate avoidance in an adaptation situation of the frequency of stuttering.

Several authorities' texts on speech disorders (7) (24) (26) point out the disadvantageous effects of stuttering avoidance upon the stuttering itself. They illustrate that the common therapeutic practice is to discourage avoidance devices on the part of stutterers. These texts indicate that stuttering avoidance is seen as a maintaining causal

factor in stuttering through anxiety reinforcement. Despite the prevalence of this opinion and its obvious clinical significance, no objective study has been conducted specifically concerning it, to the knowledge of the experimenter. For these reasons this study has been undertaken.

Since it has been empirically demonstrated that significant adaptation takes place in consecutive readings of the same material and since avoidance of stuttering is assumed to have a maintaining effect on future stuttering, this study is designed to answer the following questions:

(1) Does deliberate avoidance of feared words tend to produce more subsequent stuttering?

(2) Does avoidance of feared words tend to produce a greater subsequent increase in the frequency of stuttering in severe cases than in the less severe ones?

(3) Do severe stutterers as contrasted with mild stutterers show different adaptation rates?

(4) Does avoidance of feared words alter the usual rate of anticipation?

If phrased in terms of the null hypothesis this research problem may be stated as follows: "In the course of an adaptation reading situation, the deliberate avoidance of feared

words by stutterers on one reading trial will not produce an increase in the frequency of stuttering on the trial subsequent to the avoidance trial. This hypothesis will hold true for both "severe" and "mild" stutterers if frequency of stuttering is used as the criterion of severity.

IV SUBJECTS

The subjects who participated in this study were stutterers being examined at the out-patient speech clinic at Western Michigan College of Education during the 1952 and 1953 school years. All of the subjects were secondary stutterers in the process of being examined for possible therapy. None had already received therapy at Western Michigan College.

The group consisted chiefly of adult and young adult stutterers. Only fourteen of the forty-seven subjects were under seventeen years of age. The age of the stutterers ranged from thirteen years to forty-nine years with a mean age of twenty-three years. Thirty-one of the subjects were male, and sixteen were female.

The severity of the stutterers was determined by the number of stutterings they had on the first reading in the adaptation session. Those subjects with twenty or more stutterings on the first reading were considered severe stutterers. Those subjects with nineteen or less stutterings on the first reading were arbitrarily considered mild stutters. This rating system was used because the nature of

stuttering limits any severity rating to the actual speech performance observed. At one time or in another situation he may be classed as very severe. Yet in general, the frequency of the moments of stuttering has been used as one indication of the over-all severity of the disorder. Johnson and Colley (8) found a high degree of relationship between frequency and duration of stuttering. Since the conditions of the situation were roughly identical for all subjects, those who showed more stuttering were deemed to be more severely handicapped than those who showed less.

V EXPERIMENTAL PROCEDURE

The experimental procedure was as follows. All reading by each of the forty-seven subjects was done at one sitting with only the experimenter serving as the audience. The standard reading passage "My Grandfather", (see appendix) was presented to each subject with the instruction that follows:

INSTRUCTIONS TO SUBJECTS

> You are to read this passage aloud five times. With a one minute pause between readings. I will record your stuttering blocks and tell you how many you have had at the end of the session. On the fourth reading you are to avoid all words on which you expect to stutter. On the fifth reading you will not avoid any, but read each word as in the first three readings.

Stuttered words were marked by the experimenter on mimeographed copies of the passage. After the passage had been

read through five times as the subject was instructed they were told that they were through and could wait outside until their blocks were counted and that then they would be informed of the number they had had during the readings. A separatecopy of the mimeographed passage was used by the experimenter to record the stuttering blocks in each individual reading during the adaptation sessions. The experimenter under-scored each word he judged as a stuttering block. This is the same procedure followed by Johnson and Knott (11) for recording moments of stuttering.

The observational reliability of the experimenter was determined prior to the collecting the data in the following way:

A phonograph record of stuttering speech was played on each of four different days, and stuttered words were marked on mimeographed copies of the material. The average percent of agreement from day to day in terms of the number of stuttered words marked was computed in the manner which follows:

Counts were made of the number of words marked on each of the four days, of the total number of different words marked during the course of the four days, and of the number of words marked on all four days, on three days only, on two days only and on one day only. The agreement on particular words marked was computed by the formula $\frac{x}{y}$ = per cent of agreement, in which y represents the maximum possible number of agreements and x represents the number of obtained agree-

ments. The maximum possible number of agreements was determined simply by multiplying the total number of different words marked during the course of the four days by six. The number six was used here because maximum possible agreement would involve the marking of every word marked at all on each of the four days, the experimenter, by marking a given word as stuttered on each of four days, would agree with himself six times, since the number of times that four things or events can be combined, taking them two at a time, is six, the formula being $.5n(n-1)$. Where n equals four, the above formula gives the value six. The number of obtained agreements was found by computing the number of times the experimenter agreed with himself in marking each of the words marked at all, and by summing the values thus obtained. For a word marked as stuttered on one day only, the experimenter would show no agreements with himself; for a word marked as stuttered on two days only, he would obviously agree with himself once; for a word marked on three days only, he would agree with himself three times; and as indicated above, he would show six agreements with himself in marking a word on every one of the four days. Therefore the formula yields a measure which may be represented as the per cent of the maximum possible agreement shown by the observer.

The recording played on the four days consisted of the speech of four individual stutterers, each of whom read the standard 180-word passage "Arthur, the Young Rat". The

percents of maximum possible agreement on stuttered words, as computed by the above formula, were as follows:

Stutterer No. 1, .92; stutterer No. 2, .87; stutterer No. 3 .91; and stutterer No. 4, .94; the average per cent of agreement was .91.

In order to study the effect of deliberate avoidance of the adaptation phenomenon the data gathered for the forty-seven subjects was arranged and analyzed in three distinct groups.

These groups were as follows:

(a) group 1. included the raw data of all forty-seven subjects.

(b) group 11. included all subjects who scored ninteen or less blocks on the first reading, the mild stutterers.

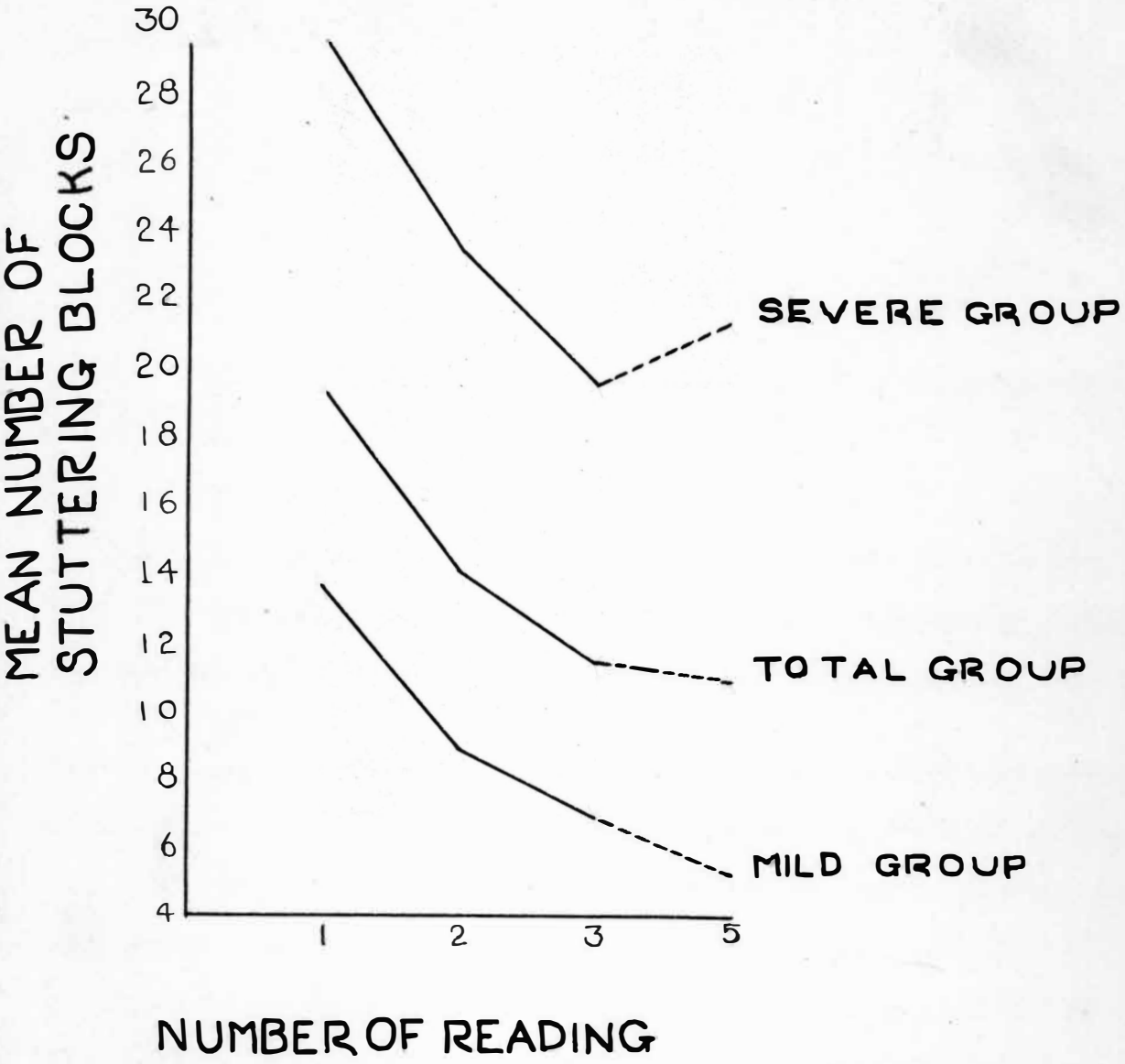
(c) group 111. included all subjects who scored twenty or more blocks on the first reading, the "severe" stutterers.

VI RESULTS

The results of this study are summarized in Tables 1, 11 and 111 and in the graphs of Figures 1 and 11. They show the frequencies of stutterings in consecutive readings of the same passage. These frequencies are expressed in terms of the means, the standard deviations, the differences between the means and the significance of these differences as shown by t scores. The standard deviations (σ_R) for each reading were computed using the formula: $\sigma_P = \sqrt{\frac{N\Sigma X_w^2 - (\Sigma X_w)^2}{N(N-1)}}$ as given in Dixon and Massey (3). This was done for the total group of stutterers and also for the severe stutterer and the mild stutterer groups.

The validity of the difference of the means was computed from the null hypothesis technique of Dixon & Massey (3) using the equation: $t = \frac{\bar{d} - \lambda_{\bar{d}}}{\sigma_d/\sqrt{N}}$ In this formula t is the confidence level, $\bar{d}$ is the mean difference between readings, $\lambda_{\bar{d}}$ is the mean of the difference, σ_d is the standard deviation of the mean, and N is the number of subjects according to Dixon & Massey (3) upon which this statistical treatment is based. The null hypothesis is that the mean of the difference ($\lambda_{\bar{d}}$) is zero. If the t value obtained is equal to or less than the t value given in the table for a particular confidence level the hypothesis cannot be rejected, which indicates that the difference of the means is not significant. If the t score in this exper-

FIGURE I



dotted lines show relation of R3 to R5

TABLE I

MEANS ($\bar{X}$) AND STANDARD DEVIATIONS (σ) FOR EACH GROUP*

	Code	R_1	R_2	R_3	R_4	R_5
A. Total Group:	$\bar{X}$	19.08	14.22	11.66	0.84	11.28
		10.14	9.09	8.32	1.49	10.49
B. Severe Group:	$\bar{X}$	29.53	23.46	19.76	1.82	21.64
		9.20	7.55	7.04	1.98	11.66
C. Mild Group:	$\bar{X}$	13.17	8.96	7.06	0.23	5.40
		4.20	4.62	4.66	0.50	4.67

*See Appendix B Section 1 and 2

TABLE II

MEAN DIFFERENCE BETWEEN READINGS*

	R_1-R_2	R_2-R_3	R_3-R_5
A. Total Group:	-4.87	-2.55	-0.38
B. Severe Group:	-6.06	-3.71	1.82
C. Mild Group:	-4.20	-1.90	-1.67

*R_4 is not treated since it is the control reading during which stuttering was deliberately avoided.

TABLE III

VALIDITY OF THE DIFFERENCES BETWEEN THE MEANS EXPRESSED AS "t" SCORES*

	R_1-R_2	R_2-R_3	R_3-R_5
A. Total Group:	-11.76	-5.88	-0.72
B. Severe Group:	-4.71	-3.78	1.96
C. Mild Group:	-6.45	-9.64	-1.14

*See Appendix B, Section 3.

TABLE IV

CONFIDENCE LEVELS IN TERMS OF "t" VALUES*

Degrees of Freedom N-1	CONFIDENCE LEVELS 0.10	0.05	0.01
16	1.75	2.12	2.92 = t
36	1.69	2.03	2.72
46	1.68	2.02	2.69

*From Table 29, Garrett (4)

iment is calculated to be greater than the t value given for a particular confidence level the hypothesis can be rejected, which implies there is a significant difference in the means. σ_d was computed from this formula: $\sigma_d = \sqrt{\frac{N\Sigma d^2 - (\Sigma d)^2}{N(N-1)}}$ where d is the difference between readings.

Our first task was to test the assumption that adaptation to the speaking situation actually did occur. This phenomenon has been shown by all of the other researches (see summary of the literature) and our own results corroborate their findings. The graph in Figure 1 shows a swift decrement in frequencies of stuttering. The scores, which are given in Table III, indicate that there is a statistically significant reduction in the mean number of blocks in all groups between the first and second, and between the second and third readings. The reduction of the mean is significant at much less than the 1 % level of confidence in each of these cases, proving that adaptation has taken place between reading one and reading three.

Our next task was to test our first null hypothesis that the avoidance reading (Trial 4) would not be followed by an increased frequency of stuttering on the subsequent reading, when all stutterers were combined into one group irrespective of severity (initial frequency). Inspection of Table III will demonstrate that there is no significant difference in mean frequencies of stutterings between reading Trials 3 and 5 if the entire sample of stutterers are combined into one group.

The t score is equal to -0.72 indicating a significance of almost pure chance. Therefore our null hypothesis cannot be rejected. In other words, if all stutterers are combined into a single group, the avoidance reading (Trial 4) produced no significant increase in subsequent stuttering.

Our next task was to test our second null hypothesis, that neither the "severe" stutters as a group or the "mild" stutterers as a group would show an increased frequency of stuttering on the reading subsequent to the avoidance reading. Our results as expressed in the graphs and tables do not permit us to reject this null hypothesis with complete confidence for both "mild" and "severe" stuttering groups.

For the "mild" stutters, the t score of -1.14, showing the validity of the differences between Readings 3 and 5, does indicate that our null hypothesis is corroborated for this group. As the graph in Fig. 1 shows, the mild stutterers continued to adapt in terms of less stuttering even despite the influence of the avoidance reading. Table 11 demonstrates mean decrease of 1.67 between these two reading.

When the "severe" stutterers are considered as a group, an opposite tendency is noted. First of all, as the graph in Fig. 1 shows, this group showed an increase in stuttering on the reading following the avoidance experience. The difference between the means of Readings 3 and 5 was a positive 1.82, thus reversing the cumulative decrease which had been theretofore occuring. How valid is this reversal? The t score was com-

puted as being -1.82. When translated into confidence levels (Table IV) this indicates that although we cannot reject our null hypothesis at the five per cent level of confidence, we can certainly do so at the ten per cent level. (The t value for the ten per cent level of confidence is 1.75. Thus, by interpolation, the true confidence level is probably less than 7.0 per cent.) This means that when severe stutterers have the experience of avoiding feared words, an increased amount of stuttering tends to occur on subsequent readings. It also means that this finding is to be accepted with caution. However, we should note the reversal in the direction of adaptation together with the fact that the relatively small population of severe stutterers in our sample, tends to lower our t scores (due to the heavy weighting of N in our formula.) These two factors allow us to hypothesize that a larger number of severe stutterers might possibly bright our t scores up to the values indicating less than a five per cent confidence level. Our data, strictly interpreted, do not permit us to reject the null hypothesis even for the severe stutterers as a group. However, there are indications that avoidance has some deleterious effects, especially upon severe stutterers.

VII CONCLUSIONS

This study was designed to investigate the possible effects of deliberate avoidance of feared words on the frequency adaptation phenomenon. The experimental procedure attempted to test the assumption that the frequency adaptation process would be slowed down or reversed by introducing the experimental variable of avoidance of feared words. This assumption is frequently found in the literature on stuttering where avoidance is commonly viewed as a maintaining cause of the disorder. Also, the effect of avoidance on severe stutterers as opposed to mild stutterers during the adaptation effect was studied. Clinical observation has indicated that many mild stutterers can successfully avoid specific feared words with less detrimental effect than can severe stutterers.

With the limited sample used in this study and the experimental design conducted, the following conclusions can be made:

1. The adaptation phenomenon was demonstrated to occur in the entire group of 47 stutterers on all of the first three readings. It is necessary to exclude the fourth and fifth readings since the experimental variable was introduced during the fourth reading and the fifth reading was possibly effected also.

2. The experimental variable of avoidance did not show any statistically significant effect in terms of increased stuttering on the fifth reading for the total group.

3. The experimental variable of avoidance did not show any statistically significant effect on the fifth reading adaptation effect for the mild stuttering group.

4. The experimental variable of avoidance did not show any statistically effect on the fifth reading adaptation effect for the severe stuttering froup at the five per cent level of confidence. It did, however, show a significant upward increment in the adaptation curve for the fifth reading at the ten per cent level.

It seems apparent that a significant adaptation effect was being accomplished for the whole group up to the fourth reading. The sudden slowing down of adaptation may be explained as due to the fact that the mild stutterers may have neutralized the effect of the severe stutterers in the group as a whole since there were considerably more mild than severe in the sample. The sudden slowing down of adaptation might be explained as the normal adaptation "plateau" which is occasionally reached within five readings. If this is the case however, it would seem that the severe stutterers results were more significant than the statistical analyzation indicated since they showed an increase in stuttering frequency subsequent to the avoidance experience. If such is the case, a real significance in the effect of avoidance on severe stutterers in an adaptation situation seems to be indicated by this rise in frequency for them. If, in turn, the adaptation is parallel to experimental extinction as

expressed in general learning theory, then there seems to be some support for the hypothesis that avoidance of "feared words" and perhaps even "feared situations" does serve as a maintaining causal factor in severe stuttering.

Future study of this problem might gain more conclusive results if the following procedures were followed:

1. The experimental variable might more effectively be inserted if it were used as the third reading. By doing this the possibility of the adaptation effect counteracting the avoidance effect might be lessened. Normally, the full effect of the adaptation phenomenon does not take place until after five readings.

2. Since the large percentage of mild stutterers may also have had some effect on this study, further study should be confined to severe cases.

3. It might be advantageous to have at least three readings after the experimental variable is introduced in case the effect of the variable, in its effect upon frequency, is somewhat delayed.

VIII SUMMARY

Forty-seven stutterers were used in this study in an attempt to answer the questions: "Does deliberate avoidance of feared words in an adaptation reading situation increase the frequency of stuttering?" "Does deliberate avoidance of feared words in an adaptation situation affect the frequency of stuttering in mild stutterer differently than it does for severe stutterers?"

Each stutterer read a 132 word passage, "My Grandfather", five times in succession. On the fourth reading they were told to"avoid" all words on which they anticipated stuttering.

The third readings were compared with the fifth readings in order to determine the effect of the avoidance variable on the frequency of their stuttering. The total group showed no statistically significant decrease or increase increment; the mild stutterers showed no statistically significant increase in frequency; the severe stutterers showed an increase in frequency statistically significant at the ten per cent level of confidence.

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APPENDICES

APPENDIX A

Data:

Subject No.	R_1	R_2	R_3	R_4	R_5	Subject No.	R_1	R_2	R_3	R_4	R_5
1	21	14	11	0	13	25	18	6	6	0	2
2	19	13	9	0	11	26	9	7	2	0	0
3	41	32	27	3	25	27	7	9	4	0	1
4	12	8	7	0	3	28	11	6	4	0	1
5	27	20	15	0	21	29	20	15	14	1	15
6	22	18	16	0	16	30	16	11	11	0	13
7	31	30	27	4	29	31	18	17	15	1	19
8	6	2	2	0	1	32	14	6	5	0	6
9	10	7	6	0	4	33	19	11	10	0	9
10	16	11	12	0	9	34	13	3	3	0	0
11	19	19	17	2	14	35	15	6	2	0	0
12	13	14	12	1	13	36	23	24	15	1	14
13	24	17	15	1	14	37	16	14	11	0	8
14	36	21	20	3	28	38	7	6	0	0	0
15	17	10	9	0	7	39	41	37	38	6	46
16	9	7	6	0	2	40	18	14	11	0	12
17	11	3	2	0	0	41	31	26	23	3	26
18	14	14	13	1	3	42	35	37	22	2	25
19	27	15	14	0	11	43	30	25	15	0	19
20	19	12	10	0	6	44	9	1	2	0	0
21	12	7	2	0	0	45	12	11	11	1	15
22	10	11	8	1	3	46	52	31	29	6	31
23	6	3	0	0	0	47	21	20	20	1	14
24	20	17	15	1	21						

Raw scores in terms of frequency of stuttering for each reading (R_1, R_2, etc.).

APPENDIX B

STATISTICAL EQUATIONS USED IN DETERMINING RESULTS*

1. Equations for computation of standard deviations.

   (a) σ of the frequency of stuttering blocks:

$$\sigma = \sqrt{\frac{N\Sigma X_w^2 - (\Sigma X_w)^2}{N(N-1)}}$$

   (b) σ_d of the mean difference:

$$\sigma_d = \sqrt{\frac{N\Sigma d^2 - (\Sigma d)^2}{N(N-1)}}$$

   (c) Values of N for each group:

   general group, N=47

   severe group, N=30

   mild group, N=17

2. Equations for computation of means and mean differences.

   (a) mean number ($\bar{X}$) of stuttering blocks per subject:

$$\bar{X} = \frac{\Sigma X_w}{N}$$

   (b) mean difference ($\bar{d}$) between readings:

$$\bar{d} = \frac{\Sigma d}{N}$$

3. Equations for computation of "t" scores.

   (a)

$$t = \frac{\bar{d} - \lambda_{\bar{d}}}{\sigma_d / \sqrt{N}}$$

4. Values used in computations.

	Code	$\bar{R}_1$	$\bar{R}_2$	$\bar{R}_3$	$\bar{R}_4$	$\bar{R}_5$
general group	ΣX_w	897	668	548	39	530
	ΣX_w^2	21853	13292	9575	133	11036
severe group	ΣX_w	502	399	336	32	368
	ΣX_w^2	16138	10289	7447	124	9230
mild group	ΣX_w	395	269	212	7	162
	ΣX_w^2	5715	3003	2128	9	1806

	Code	R_1-R_2	R_2-R_3	R_3-R_5
general group	Σd	-229	-120	-18
	Σd^2	2073	712	4610
severe group	Σd	-1033	-63	32
	Σd^2	1081	493	298
mild group	Σd	-126	-57	-50
	Σd^2	898	209	316

These are the values of the terms in equations (a) and (b), part I of Appendix B.

APPENDIX C

Reading Passage Used for Experimental Procedure

You wished to know all about my grandfater. Well, he is nearly ninety-three years old; he dresses himself in an ancient black frock coat, usually minus several buttons; yet he still thinks as swiftly as ever. A long, flowing beard clings to his chin, giving those who observe him a pronounced feeling of utmost respect. When he speaks, his voice is just a bit cracked and quivers a trifle. Twice each day he plays skillfully and with zest upon our small organ. Except in the winter when the ppze or snow or ice prevents, he slowly takes a short walk in the open air each day. We have often urged him to walk more and smoke less, but he always answers, "Banana oil!" Grandfather likes to be modern in his language.

APPENDIX D

Reading Passage Used for Observer Reliability

Once, a long time ago, there was a young rat named Arthur who could never make up his flighty mind. Whenever his swell friends used to ask him to go out to play with them, he would only answer airily, "I don't know." He wouldn't try to say yes, or no either. He would always shirk from making a specific choice.

His proud Aunt Helen scolded him: "Now look here," she stated, "no one is going to aid or care for you if you carry on like this. You have no more mind than a stray blade of grass."

That very night there was a big thundering crash and in the foggy morning some zealous men with twenty boys and girls rode up and looked closely at the fallen barn. One of them slipped back a broken board and saw a squashed young rat, quite dead, half in and half out of his hole. Thus, in the end the poor shirker got his just dues. Oddly enough his Aunt Helen was glad. "I hate such oozy, oily sneaks," said she.